FAA GENERAL AVIATION NEWS

NOVEMBER-DECEMBER 1976

A FLIGHT STANDARDS SAFETY PUBLICATION FOR AIRMEN

'Twas the day before Christmas...

NOTICE TO SUBSCRIBERS:

Because of delays in publishing this magazine, following a fire at the printer's in September, FAA GENERAL AVIATION NEWS has fallen far behind the normal schedule. In order to catch up, we are combining the November and December issues with an enlarged format. We will resume regular monthly publication in January.

Merry Christmas to all.

FAA GENERAL AVIATION NEWS

DEPARTMENT OF TRANSPORTATION/FEDERAL AVIATION ADMINISTRATION VOL. 15, NO. 7/8

CONTENTS/November-December 1976

3 Out In the Cold

6 The Engine Doctor: *No Vibes Are Good Vibes*

8 Long Day's Journey Into a Snowy Night

12 Famous Flights: *The Flght of the Flea*

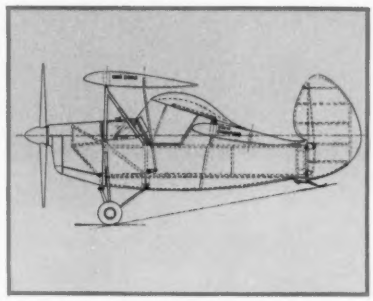
14 The Omni Present Eye

17 Briefs

18 News Log: FAA Will Release Complete List of Exam Questions . . . PIREP Format is Standardized . . . New Instrument Landing Systems

19 Flight Forum

If winter comes . . . Page 3



Tandem wing experimental Page 12

William T. Coleman, Jr., *Secretary of Transportation*
Dr. John L. McLucas, *Administrator, FAA*
R. P. Skully, *Director, Flight Standards Service*
Bernard A. Geier, *Chief, General Aviation Division*

David Gelfan, *Editor*
Gernot Rasmussen, *Art Director* Ruth Taksel Benedict, *Assistant Editor,*
Louise Oertly, *Editorial Assistant*

FAA GENERAL AVIATION NEWS is published by Flight Standards Service, Federal Aviation Administration, Department of Transportation, Washington, D.C. 20591, in the interest of flight safety The magazine is designed to promote safety in the air by calling the attention of general aviation airmen to current technical, regulatory and procedural matters affecting the safe operation of aircraft. The use of funds for printing FAA GENERAL AVIATION NEWS was approved by the Director of the Office of Management and Budget on July 30, 1974. All printed materials contained herein are advisory or informational in nature and should not be construed as having regulatory effect. The FAA does not officially endorse any goods, services, materials or products of manufacturers that may be mentioned.

SUBSCRIPTION SERVICES

FAA GENERAL AVIATION NEWS is sold on subscription at $6.20 per year (individual copies, 55 cents) by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Use the self-mailer order form in the centerfold of this magazine to subscribe. Prices are subject to change without prior notice.

Please anticipate one to two months for processing orders. Subscriptions are for one year only, and only one renewal notice is sent. Act promptly to avoid lapse of subscription.

Subscription problems. Contact the Service Section, SSOS, GPO, Washington, D.C. 20402.

Change of subscribers address. Send both old and new address to MAIL LIST SECTION, GPO, Washington, D.C. 20402.

OUT IN THE COLD

What it takes to keep an airplane healthy and happy in the wintertime

As a matter of cold fact, airplanes generally get less use in the winter, but they need more care and attention at this time than at any other season. Cold weather is a silent assailant that can cripple an aircraft in many unseen ways—congealing oil, blocking up vents and static ports, and even shrinking the structure so as to interfere with control response.

Qualified mechanics know how to prepare an airplane for winter in each locality, but the responsibility lies with the pilot to understand the basic preparation needed to insure him of smooth flying when he does fly in cold weather. The basic needs are shelter, winterization, and heating.

Ideally, aircraft in cold regions should be hangared. Even an unheated hangar is a tremendous advantage in protecting the airplane from external icing, snow accumulation and corrosion. It also affords the pilot a welcome shelter in which to work on his plane, or make a careful pre-flight examination. Where a heated hangar is used, care should be taken to avoid condensation ——top tanks before bringing the aircraft in from a flight. On departure, fuel sumps can be drained inside the hangar into a container, but they should be drained a second time if the plane stands outside in cold weather for a half hour or more.

Where a hangar is not available, a hard-surfaced airfield is preferable. Mud and slush spun off the wheels during taxiing and takeoff from dirt runways can be thrown into wheel wells and may freeze hard at altitude. Jammed wheel well doors or other landing gear problems are likely to follow. If wet muck has been accumulated on take-off, the gear should be retracted and extended several times to help clear the moving parts. If operating in sloshy conditions cannot be avoided, fixed gear wheel pants should be removed for the winter. Mud and slosh packed into them while rolling on the ground may freeze in flight and lock the wheels. (Follow manufacturer's instructions on removing wheel pants.)

Batteries

Some pilots consider battery weakness, or even failure, to be "normal" in the winter, when the aircraft is used infrequently, and assume that an hour or so in the air will bring it back to full charge. In the meantime, on a local flight, who really needs radios? This attitude is based on several false assumptions, which can easily lead to serious trouble.

In the first place a battery seldom dies from disuse alone. A weak connection, a bad generator or alternator, etc., may have contributed to its demise, in which case running the engine will not necessarily bring the battery back to life. In the second place, if all the cells are dead and you have an alternator, as most modern aircraft do, rather than a generator, only a booster charge can revive the battery. And, perhaps most important of all, if you are in the habit of flying a modern airplane the chances are that you are also in the habit of depending on auxiliary electric power whether you realize it or not. Consider the following example:

An off-duty airline pilot with an hour to spare and a recently acquired Piper *Comanche,* supposedly raring to go, found the prop failed to kick over in response to the starter button. It was a bitingly cold day and the airplane was tied down outside, so he assumed that the engine was a little stiff with congealed lubrication. He got a lineman to prop the plane, it roared into life, and he took off cheerfully expecting the battery to be charged up after an hour of flight.

The first reminder that auxiliary electric power could not be dispensed with on a sophisticated aircraft came after he automatically hit the gear-raising switch following take-off. He was greeted by only the smallest "clunk" instead of the usual grinding noise that signals the gear coming up.

"Whoops, gear won't go up. Oh well, better have it stuck down than up."

It was later that he discovered that while the electric gear motor will *not* retract the gear when the battery is dead, activating the gear handle *will* release the gear downlocks—thus allowing the gear to collapse on landing. Which it did, half an hour later, when he greased it in for what should have been a normal landing, and turned out to be a badly scraped belly and a ruined prop. (No battery meant no warning red lights.)

He was lucky. A dead battery means a loss of not only the gear operating system and radios, but also all lights, inside and outside the cockpit, stall-warning horn, pitot tube heater, engine gauges and auxiliary fuel pump, to name a few of the commonly used devices that depend on electrical power.

The fact is that auxiliary electrical power is an essential safety element in modern aircraft, and no one should attempt to fly with a weak or dead battery. Batteries have to be watched especially carefully in the wintertime because cold weather not only makes engines harder to start, it also severely reduces the wattage available from the battery, as indicated in Figure 1. Batteries operate best when the temperature is around 80 degrees or higher. At the freezing point, only about 60 percent of a good battery's optimum power will be available, and at zero degrees only about 45 percent. Something to think about, if you are flying from a sea level, temperate climate, such as that of Los Angeles, for example, up to a ski resort at Mammoth Lake in the Sierras. A test of your battery's

strength during preflight check would be well worth the effort, in terms of peace of mind, should you run into poor weather on your return, or have to make a startup in subzero temperature. As Figure 1 indicates, your engine could require two or three times the power normally needed to turn it over, on a really frosty morning, especially if, as is usually the case at mountain resorts, you are unable to hangar it overnight.

A run down battery is a potential trouble source in the winter in more ways than one. The freezing point of the electrolyte depends on its specific gravity, and the weaker the battery is, the lower that specific gravity will be. As shown in Figure 2, a fully charged cell is virtually "freeze-proof," but a badly run down battery can freeze as soon as the temperature drops below 20 degrees above zero.

In some instances, pilots have run batteries down so low by trying unsuccessfully to crank the engine to life in subfreezing conditions that when they returned to the aircraft a few hours later to try again they found the battery frozen solid (some bush pilots in Alaska make a practice of taking their airplane battery indoors with them at night, in bitter cold weather, to make sure they get enough power out of it in the morning). Incidentally, if you ever do suffer a battery freezeup, get the battery out of the aircraft right away. Otherwise, when it thaws the electrolyte will leak through the cracked shell and possibly cause serious damage to any metallic equipment it contacts.

Since you may need all the power you can get in wintertime, this is a good season to make sure that the cable clamps and terminal posts are free of dirt, acid film or other accumulations which could reduce its output. Clean the posts with a wire brush, and the clamps with a soda solution and the brush. After you have replaced the clamps, a coating of petroleum jelly will retard corrosion at the terminals.

This is also a good season to get into the habit of making sure that all radios and other electronic equipment are turned off before starting the engine. This not only minimizes the drain on your battery; it also protects your avionics equipment against possible damage. Today's aircraft avionics are more efficient than their predecessors, in that they weigh less, use less power and perform a greater variety of services; however on the other side of the coin, they are often more susceptible to *low*, as well as high, voltage peaks and extreme temperature variations. The last place you want to lose your radios is when you are flying out of remote and snowy mountain country, and you could bring about this misfortune by cranking the engine with the radio switch left on.

When it comes to actually starting the engine, many pilots are interested in one thing only: a live and kicking engine. But other pilots, particularly pilot/owners, are also interested in getting the engine started without scoring the cylinder walls, getting raw fuel into the exhaust system, wearing down the battery, or starting a little impromptu bonfire. In a word, the incautious or eager-to-get-going-pilot may overprime.

An engine which is slow to start in cold weather may be sluggish because congealed oil hampers the cranking action, or because the fuel does not volatilize sufficiently, or for various other reasons, none of which are helped by flooding the engine with fuel. An excess of fuel in the cylinder tends to wash the protective coating of oil from the walls, leaving them more vulnerable to scoring from the piston. Raw, unburned fuel in the exhaust system leads to deterioration of the components. If the engine turns over very stiffly and it is not convenient to preheat it, the prop may be pulled through by hand a few times, with the master switch and magnetos off, of course, and the aircraft securely held by brakes and tie-downs, or chocks. Hand-prop with extreme caution: any propeller that is linked to an engine *may* start with the least encouragement, regardless of switch positions. Serious accidents involving hand propping occur every year.

Aircraft that have to be started after standing outdoors in subzero weather may require some form of external heat—usually from a preflight heater that throws a stream of hot air. Preheating requires constant supervision, with a fire extinguisher at hand. The hot air stream should never be directed at fuel, oil or hydraulic lines, upholstery, canvas engine shrouds or other naturally inflammable materials. That old reliable but not notoriously safe preheating standby, the plumber's fire pot, should have a wire mesh grate between the pot and the engine to screen out flaming bits of carbon.

Carbon tetrachloride and carbon dioxide fire extinguishers can freeze if the mercury dips low enough. Make sure yours has been winterized, or you may feel very foolish with a dud cannister in your hands watching a $20,000 airplane go up in smoke in front of your eyes.

Oil

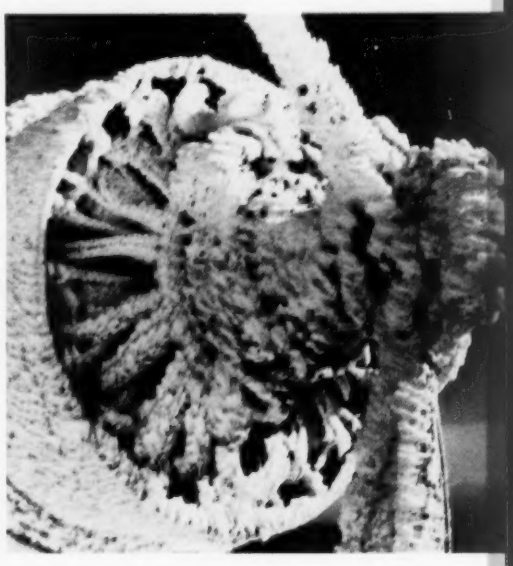
With the increased range of modern light aircraft, the possibility is greater than ever that your engine will be exposed to significant temperature variations. You may live well below the Mason-Dixon line, but if there is any likelihood that you will be making a flight to the high mountains or to the north country during the winter, a seasonal oil change in accordance with manufacturers recommendations is a good idea. The kind of oil in your crankcase makes a lot of difference to the load on your battery in cold weather starts. You can, as some Arctic flyers do, drain the oil on your arrival, keep it under your bed, and pour it back in before you leave, but not everyone is that wild about oil fumes in his dreams or on his best skiing togs.

The viscosity of the grease and oils used in an aircraft engine in winter is very important. The engine manufacturer's recommendations on oil additives should be closely followed. Oil lines should be inspected for loss of insulating material, which could lead to congealing, in very cold weather, and possibly incorrect temperature gauge readings. Repairs must be carried out by a certificated airframe and powerplant mechanic, using fireproof insulation.

The crankcase breather deserves special consideration in cold weather. During normal combustion some moisture enters the crankcase past the rings as a vapor. When the vapor cools, it may condense in the crankcase breather lines and subsequently freeze them closed. As a result, during the next flight, excessive pressure may develop in the system and rupture the front crankcase oil seal, causing oil leakage which may cover the windshield. If the engine oil pressure reads high on starting, or if the engine smokes or leaks oil in cold weather, the possibility of ice in the breather lines should be investigated. For aircraft that must operate regularly in very cold, damp conditions, a change in the breather system may be advisable. Any such modification should be approved by the manufacturer, or FAA, to eliminate fire hazard.

When an engine that has not been preheated on a freezing day starts, runs briefly and then stops and will not restart, the prob-

Frosted engine, after a sleet storm



lem may be icing of the sparkplug electrodes. What happens is that some of the moisture formed during the brief period of combustion settles on the cold electrodes and forms ice before sufficient heat can be developed inside the cylinder to prevent freezing. This of course shuts down the engine, and nothing will restart it short of removing the plugs and heating them in the most convenient manner.

Pressure

As the outside air temperature drops at the surface, and the air becomes denser, the potential power output of a piston engine increases. Supercharged or turbocharged engines can be easily overboosted (and possibly damaged) if the pilot does not calculate the proper manifold pressure or engine pressure ratio for the current pressure altitude and ambient temperature.

With simple piston engines with controllable pitch props there is also danger of harmfully exceeding the rated horsepower in subfreezing temperatures, if full power is used during the climbout, beyond the point of necessity. Power output increases at a rate of about one percent for each 10° F. of temperature below standard air temperature (59° F. at sea level). This means that the temperature would have to drop to around zero for you to get more than a five percent overboost in power. Many aircraft do operate in these conditions, however, in the northern states and in Alaska. In subzero climate, aircraft engines could develop as much as 10 percent more than the rated horsepower, even though manifold pressure and RPM limits are not exceeded.

When the airplane engine is delivering more than normal power there may be a noticeably improved climb power—a reversal of the effects of density altitude in hot weather. However, pilots should avoid unnecessary full-power operation because of the danger of internal engine damage from excessive pressure. It is possible to blow off a cylinder head in this manner.

What do you do about engine overheating during climb? The appropriate procedure for each aircraft is detailed in the aircraft flight manual by the manufacturer, and should be followed precisely—procedures vary from one design to another. In some cases, the pilot may be advised to maintain a higher airspeed during the climbout, or to reduce power slightly, or both. Excessively lean fuel/air ratio can also cause high cylinder head temperatures.

Winter Kits

FAA certificated winterization kits are available from the manufacturer for many aircraft types and models. These are preferred over homemade kits, which would require individual FAA approval and which might nevertheless invalidate the manufacturer's warranty. Kits are designed to restrict the cooling effect of airflow over the engine. A cylinder head temperature gauge should be installed, to make certain engine temperatures do not run dangerously high.

Engines which depend heavily on airflow for cooling purposes can be damaged to the point of complete failure if operated even for a relatively short time outside of the normal heat range. If you do not have a cylinder head temperature gauge on your airplane, you are probably safer without adding winter baffles.

The opposite problem to overheating—keeping the engine warm enough for smooth operation in very cold weather—is most likely to occur during letdown and approach to a landing. Under reduced power, engine heat may not be sufficient to vaporize fuel fully and maintain the proper air ratio in the mixture, especially without some form of winter covers. In this phase of flight the pilot has recourse to several procedures for increasing engine heat. By extending landing gear or flaps at an early stage of the approach he can carry a higher power setting without increased airspeed. He can also use carburetor heat. His choice of procedures would depend, again, on the engine manufacturer's recommendations for his airplane.

While preflighting in winter, it is especially important to pay attention to the feel of the control cables (engine as well as airfoil). Moisture may freeze during the night before a flight in such a manner as to restrict the movement of control linkage.

A fuller discussion of this subject is available in "Cold Weather Operations," (FAA Advisory Circular 91-13A). Send a mailing label to DOT Distribution Unit, TAD-443.1 Washington, D.C. 20590, when requesting your free copy. ■

In extreme cold, preheating the engine (with care) helps keep it running young

Engine's amperage appetite goes up in winter

Fig. 1

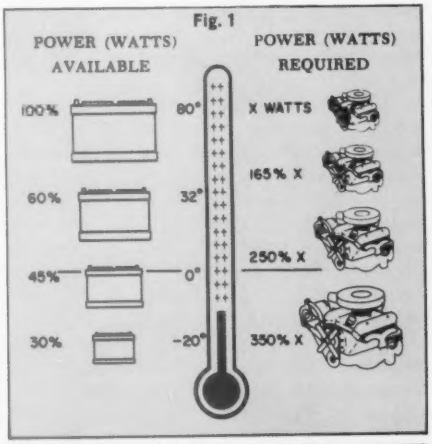


Fig. 2

Specific Gravity / Freezing Point

	F		F
1.100	18°	1.220	-31°
1.120	13°	1.240	-50°
1.140	8°	1.260	-75°
1.160	1°	1.280	-92°
1.180	-6°	1.300	-95°
1.200	-17°	(fully charged)	

The ENGINE DOCTOR:

NO VIBES ARE GOOD VIBES

Dear Engine Doctor:

A friend of mine had an engine stop dead on him with a busted crankshaft recently, and he was lucky to get it on the ground in one piece, more or less. They told him the crankshaft gave out because it was "detuned." That scares me. If I don't keep my airplane engine tuned up is my crankshaft likely to break?

A. Not really. A propeller/crankshaft system that is "detuned" is entirely different from one that needs to be "tuned up." Detuning has to do with a malfunction of the crankshaft's "floating counterweight" system —also called dynamic dampers or pendulum dampers. When the floating counterweight system is impaired, this leads to excessive torsional vibration, and eventually to failure of the shaft.

Q. *Why should the shaft vibrate? Does that mean it wasn't installed or built properly in the first place?*

A. No, every crankshaft vibrates torsionally because of the way intermittent power impulses are transmitted to it. I don't know if you've ever cranked a car engine by hand, but if you did you were probably aware of the shaft flexing or twisting slightly. You can imagine how much twisting goes on when the equivalent to several hundred horses are doing the cranking. Consider that when a six cylinder engine is running at 2,500 revolutions per minute, the crankshaft gets jolted 7,500 times every minute! Anything hit that often is going to vibrate some, take my word for it .

Q. *How do floating counterweights help?*

A. They absorb some of the shock energy and reduce the magnitude of the vibrations.

Q. *Isn't a counterweight simply a weight of some kind placed at a point on the shaft opposite the crankpin? How does it get* out of tune?

A. What you describe is one type of counterweight, but here we are talking about a *floating* counterweight, which is different. Floating counterweights are essentially pendulums, which are fastened to the crankshaft in such a manner that they are free to move in a small arc. They are used in pairs, and there may be two or more pairs for a crankshaft. (Each pair of counterweights is designed to counteract vibration of a given frequency). The distance the pendulum moves and its vibrating frequency, corresponds to the natural frequency of the crankshaft/propeller system. The pendulum is designed to oscillate out of tune with the crankshaft vibrations, thereby opposing these vibrations and reducing them to a minimum. Is that clear?

Q. *Well, I'm getting some pretty good vibes. But how does it get* out of tune?

A. If the dynamic damper system is damaged, worn or overloaded the shaft can start vibrating to an intolerable degree. This is what we mean by *detuned.* You remember that in dynamic damping the floating counterweight moves freely in its track, or race, and is usually suspended by close tolerance rollers. If you get a dent or pit or worn spot in the race it will interfere with the free movement of the pendulum and affect its tuning.

Q. *That's when you get the bad vibes?*

A. Right. The worst of it is, you have no advance warning unless the mechanic detects the damage or wear during a major overhaul.

Q. *You mean the pilot couldn't feel those heavy vibrations in the cockpit?*

A. Probably not, with all the other vibrations from the propeller and the airframe and so forth. In any case, these bad vibes, as you call them, would not be constant. It could be that only one particular power setting would cause the counterweight to detune. You might be able to fly the airplane for many hours with a damaged damper race, without a sign of trouble. Then one day out of the blue the crankshaft snaps and the engine quits—very sudden—and you start surveying the real estate for a place to put it down.

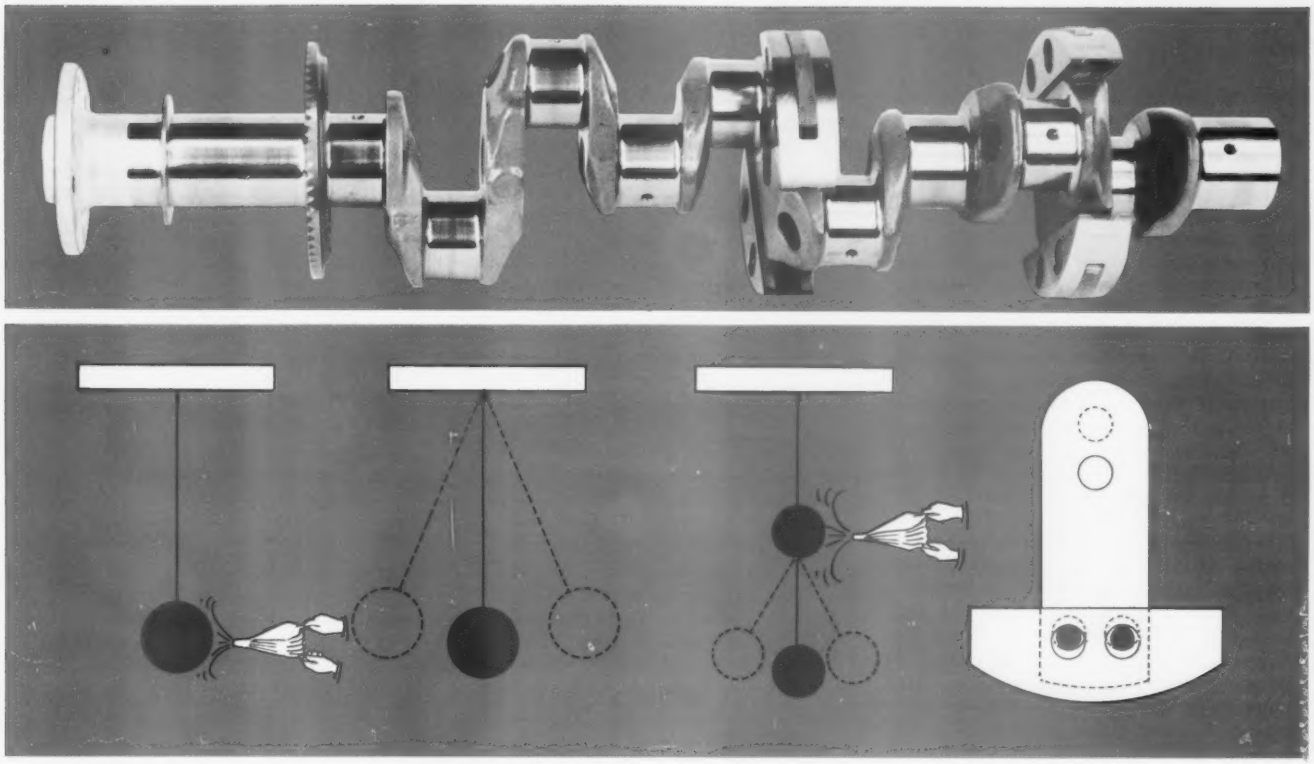
Q. *I gather that not all engines have these floating counterweights. How can I tell if mine has them?*

A. That information is in your engine operating handbook, if you have one. If not, you can ask your mechanic or the engine manufacturer or an FAA Airworthiness Inspector at a General Aviation District Office. Most four cylinder engines will not have these pendulum dampers on the crankshaft (although a few do). On the other hand, most engines with six cylinders or more *will* have the dampers. But it isn't all that important to the pilot to know whether he has floating counterweights on his crankshaft. What is important is that, regardless of how the shaft was designed, its longevity depends to some extent on the operating practices of the pilots who fly it—how the airplane is flown.

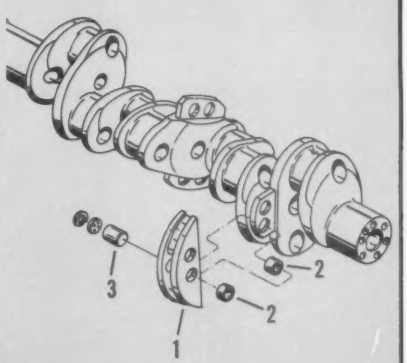
Q. *Are you telling me that this is another case of pilot error?*

A. You might say so. Not all pilots realize the effect of power settings and throttle handling on the engine. It may help you to visualize the load that the crankshaft of an aircraft engine has to carry. The load on the engine at any given time is derived from the cylinder (or manifold) pressure, and the inertia of the revolving reciprocating parts. The closer these two forces are balanced the less the strain on the crankshaft.

Steep power-off descent is one way to detune an engine that has floating counterweights.



Top—crankshaft from a six-cylinder Continental engine, showing counterweights. Lower diagram shows double pendulum principle, on which counterweight system is based. A series of thrust impulses, such as air from a bellows, will cause pendulum to swing in time with blasts. However, if a second pendulum is hung from the first, the second will absorb energy, leaving first pendulum nearly stationary.



Floating counterweights are always used in pairs, sometimes several pair per engine. Each pair counteracts vibration at a given frequency. Diagram shows typical counterweight assembly.

For example, any operating procedure involving high speed and low manifold pressure (under 15 inches) such as might take place during a steep "power-off" descent, with zero thrust and windmilling prop, might cause detuning by imposing too great a strain on the counterweight system. You should always be familiar with the speed and pressure limitations for your engine and take care not to exceed them, except in an absolute emergency.

Q. *Aren't you talking now about controllable prop aircraft? What about fixed pitch airplanes—do they have any problems with detuning?*

A. They can—if the crankshaft is equipped with floating counterweights, and if the pilot handles his engine roughly.

Q. *I have never even seen the crankshaft of my airplane. How could I harm the counterweights?*

A. One of the quickest ways to detune that engine is with rapid throttle operations. Suppose, for example, in a twin you want to simulate an engine failure. (Be sure you have plenty of altitude—this practice is not recommended for low level flying.) Good engine operating procedures suggest that you do this by means of the mixture control, leaving the throttle in normal open position until the engine has slowed down for lack of fuel, and then closing the throttle to zero thrust. Leaving the throttle open initially allows the cylinders to fill with air, and maintains the normal compression forces that cushion the deceleration of the engine. But if you simulate the engine failure by snapping the throttle shut, you get a very abrupt drop in pressure while the rpm rate is still fairly high. This can put a heavy strain on the crankshaft, and possibly cause detuning, because the weights tend to bump and rattle around and damage the counterweight system. Occasionally this leads to crankshaft failure, although it is pretty rare; of the dozen or so crankshaft failure accidents each year there are only one or two that are related to counterweights. But even if it does not lead directly to crankshaft failure, any flying habit that puts an excessive load on the engine is bound to weaken or "age" some of its integral parts and shorten their lifespan. Any way you look at it, it pays to fly right.

Q. *Aren't you saying that bad pilots have bad vibes?*

A. I'm suggesting that if you fly the airplane the way it was meant to be flown, you will never know you have a crankshaft.

Next, please. ■

LONG DAY'S JOURNEY INTO A SNOWY NIGHT

A pocketful of miracles was needed to get these flyers all the way home for Christmas

The cheery red light blinking it way across the snowy skies of Ohio that night before Christmas in 1974 was not the nose of Rudolph the Reindeer but it served a similar purpose, identifying the green and white *Cherokee Six* that was concluding a long and weary 3,100 mile cross-country flight and bringing home six young men to spend the holidays with their families in the East. The only problem was that the *Cherokee*, unlike Santa's sleigh, was not adept at roof-top hopping, which is about what it was doing in the middle of this dark and bitterly cold Saturday night, heavily iced up and with an ailing engine. The passengers on board had been dozing for much of the trip, but now their white, anxious faces were pressed against the windows. There was very little to see, but the snow-covered ground was much too close. That much they all knew.

Their pilot was an 18-year-old college student with a scant 200 hours of flying experience in his logbook and no instrument rating. His only experience in this type of aircraft was a one-hour checkout in the 260 hp. *Cherokee Six* just prior to departure. But he was one of those youths who are born to fly, and despite his weather and mechanical problems and the responsibility on his shoulders for all those young lives he refused to panic. It was good that he did not, because he was to need all of his resourcefulness before that night ended—plus an assist from a Christmas angel or two.

The flight had begun at San Jose, Calif., where the young pilot, whose home was in New York, was a student at San Jose State College. After his classes were over on Friday he went out to the airport, checked out in a rental *Cherokee Six* and then took off for Boulder, Colo. where he was to pick up three old friends from his high school days in New York and two other Colorado U. students from the eastern part of the country. Together they would fly back east for the holidays. Plans were to fly to New York City, with drop off stops at Cleveland and Boston. Sharing the airplane expenses provided cheap transportation home for the boys, and allowed the pilot to add some 40

hours in his logbook for the round trip. The projected flight of more than 3,000 miles one way was to be accomplished within two days; by Sunday night they would all be home with their families.

The first leg, approximately 1,000 miles, was negotiated solo without incident. The pilot arrived in Boulder early Saturday morning, caught a few hours sleep, refueled and loaded up the airplane with the students and their Christmas packages. The weather was clear VFR and the pilot did not file a flight plan. They took off at 2:30 p.m. (All times given are local standard time.)

By 9:30 p.m. they were in Springfield, Ill. where they refueled, grabbed a sandwich and checked the weather for Cleveland. Decatur (Ill.) Flight Service Station provided the weather briefing, by phone from the Springfield airport, at 9:47 p.m. At that time the latest surface report for Cleveland showed 1,400 foot overcast, six miles visibility, very light snow and fog, and more of the same expected. Not too good for VFR, but the pilot decided to push on as far as the weather permitted. Perhaps he could drop off his Ohio passenger at a nearby airport if Cleveland did not improve.

At 10:22 p.m. Springfield Tower cleared the *Cherokee* for takeoff and the pilot pointed the aircraft eastward as it climbed out into a dark but star-studded winter sky. Two and a half hours later they were over central Ohio, tracking into the Mansfield VOR at 7,500 feet. Clouds that were beginning to form about 1,000 feet below offered the first sign of the weather system that was blanketing the eastern part of the country with a pre-Christmas coat of white. The pilot tuned his radio to 122.6, the remoted frequency for communication with Columbus (Ohio) FSS, via Mansfield, to update his Cleveland weather data. "Snow activity and IFR conditions, low ceilings and fog." He reluctantly acknowledged to his companions who were dozing in their seats that he would probably have to divert to an alternate airport and opened his chart a couple of more folds to assess his situation.

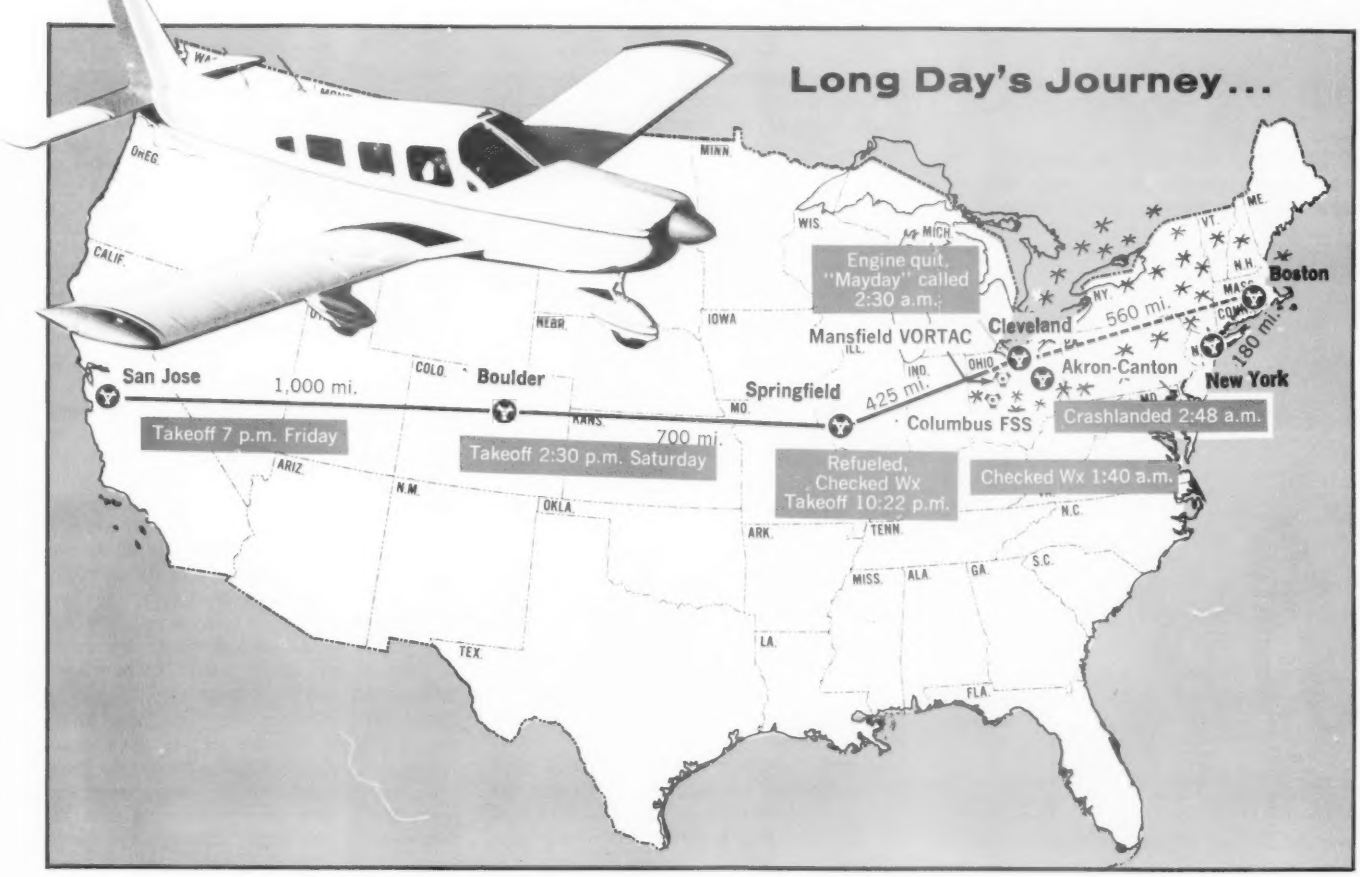
He was now about 60 miles short of Cleveland and the clouds below were definitely becoming solid, just as Columbus FSS had reported. The station had informed him that the weather was better to the south—over into Kentucky—where they were reporting clear skies or scattered clouds. In the dim cockpit light the young pilot began mentally to convert inches on the chart to mileage and time. At least he had plenty of fuel. All he had to do was pick an airport in Kentucky, fly there and land, and wait out the storm—hopefully not too long or they might not make it home for Christmas.

While they waited he could grab a little much-needed rest. It was 2:12 a.m. Except for one rest stop he had been flying almost ten hours. And before that, with just a few hours sleep between, he had flown the seven hours from San Jose to Boulder.

The "to" on the VOR indicator turned to "from" as the passed over Mansfield VOR. The pilot and his (non-certificated) copilot were discussing possible landing spots when an unmistakable change in the sound of the engine brought them both up short and suspended the conversation in mid-sentence. Pushing the carburetor heat lever down into the full on position did not seem to help; the engine continued to run rough. It worsened until the prop was barely turning; at 610 rpm they could no longer maintain level flight. As the aircraft, which had been flying on top, slipped down into the clouds, the pilot reached for the microphone.

"Mayday—the engine has quit and we're in IFR conditions."

He heard Columbus's acknowledgement but was too busy to answer the question regarding his position. Instinctively he began to set up a normal glide speed, but when he saw that rime ice was beginning to build up on the wings he decided that what he needed most was to get

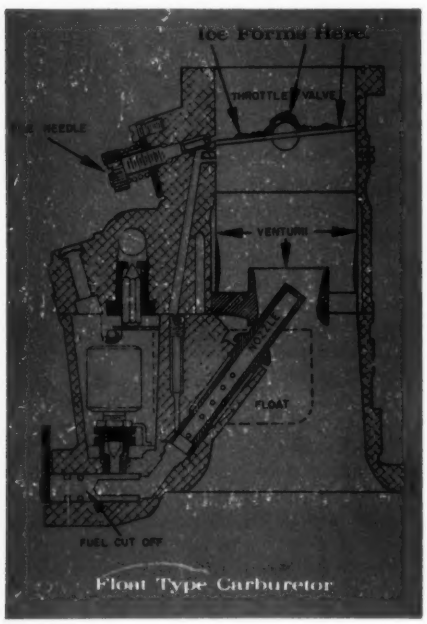


down through the clouds and out of them just as fast as he could, so he accelerated his descent to 2,000 feet per minute. He was grateful for the several hours of instrument training that made it possible for him to keep the airplane under control as they slid down through the clouds. He was still convinced his engine problem was due to carburetor ice, but apparently the carburetor heat was not sufficient to eliminate it in the present flight conditions.

The pilot remembered hearing that inducing backfire through the carburetor will sometimes dislodge ice. He instructed his copilot to pull out the mixture control almost to the idle cutoff position, then when the exhaust temperature gauge reading showed well above normal, he shoved the mixture control in to full rich.

"Boom!" They could feel as well as hear the sought-after burn through the carburetor, followed by heart-warming sounds of the engine returning to something like normal power. Apparently the ice had been "torched" out of the carburetor.

Above—carburetor, heavily iced. *Below*—butterfly valve is where ice generally forms.



Seconds later they broke out beneath the clouds—in snow and fog, perhaps 150 feet above the ground where they could see some lights, faintly. But at least the engine was running. There was a road beneath them that might offer an emergency landing site, so the pilot circled over it while he called Columbus FSS back to report on his present situation and to see if he could get some help in finding an airport.

In the Columbus FSS, Specialist Charles Hemmelgarn was very relieved to hear from the *Cherokee* at 2:18 a.m., five minutes after the original "Mayday" call. Hemmelgarn was working all positions on the Columbus "graveyard" shift that night, and had given the earlier weather information to the pilot (including the routine "VFR not recommended" caution) as well as locations of possible alternate landing places. He had also taken the emergency call when the engine failed, and had advised the pilot to check the magneto switch, change fuel tanks, try carburetor heat, etc. When he had asked the pilot's position there had been no reply, and he was unable to get a direction finding (DF) bearing during the brief transmission, so he activated the DF network and checked with Columbus Tower Approach Control to see if they had a radar target that might indicate the *Cherokee's* position. (None of these efforts had proved fruitful, however; the plane was more than 60 miles from Columbus airport at the time.)

The *Cherokee* was now so low that many of the transmissions were unreadable. The pilot tried to pinpoint his location but he could describe no landmarks that would help; *he was not over an industrial area*, he said, *nor over a densely populated area.* Finally Hemmelgarn suggested he make another "Mayday" call on 121.5, the emergency frequency, in the hope that someone closer would hear, and the pilot did so. At 2:28 a.m. Akron-Canton Control Tower picked up the call.

"November 754X, this is Akron-Canton Approach Control, what is your problem?"

An airline pilot flying far overhead also answered. "54X", this is United, we read you loud and clear. If you need any help in relaying transmissions we'll be glad to help." The friendly offer proved unnecessary, however, since communication with Akron-Canton was no problem.

The pilot explained once more that he had lost his engine and come down through the clouds and that although he had the engine running now, he had ice on the airplane and was circling, in snow and fog, about 150 feet above the ground somewhere between Mansfield and Briggs VORTACs. *Could they give him vectors to Akron-Canton—or any airport?*

Vectors, however, were impossible until they pinpointed his location, which thus far they had been unable to do, either on radar or with the direction finder. He would have to climb, but that meant flying into clouds.

"54X, are you instrument rated?"

"That's negative. But I've had a lot of instrument training."

Considering the situation the controller determined there was no alternative and cleared 54X to Briggs VORTAC (ten miles south of the airport), to climb to and maintain 3,000 feet, and he tried to comply, but at 2,500 feet the engine faltered again and the airplane began to vibrate badly (he guessed from prop ice) and he could no longer read the instruments, so he came back down underneath the clouds. Meantime, however, he had been identified on radar.

"Ah, 54X, we have you in radar contact, 17 miles southwest of the Akron-Canton Airport. Would you prefer vectors to Akron-Canton or to Wayne County Airport?" The latter was closer but was uncontrolled and would probably have fewer facilities, so the pilot opted for Akron-Canton with its radar and four concrete runways, and was given an appropriate heading.

"What is your altitude, 54X?" asked the controller.

"I'm about 80 feet above the ground."

"Can you climb at all?"

"Negative." He explained about the ice on the aircraft.

"Can you hold that altitude and maintain your airspeed?"

"I think so." A little later he was vectored around several radio towers.

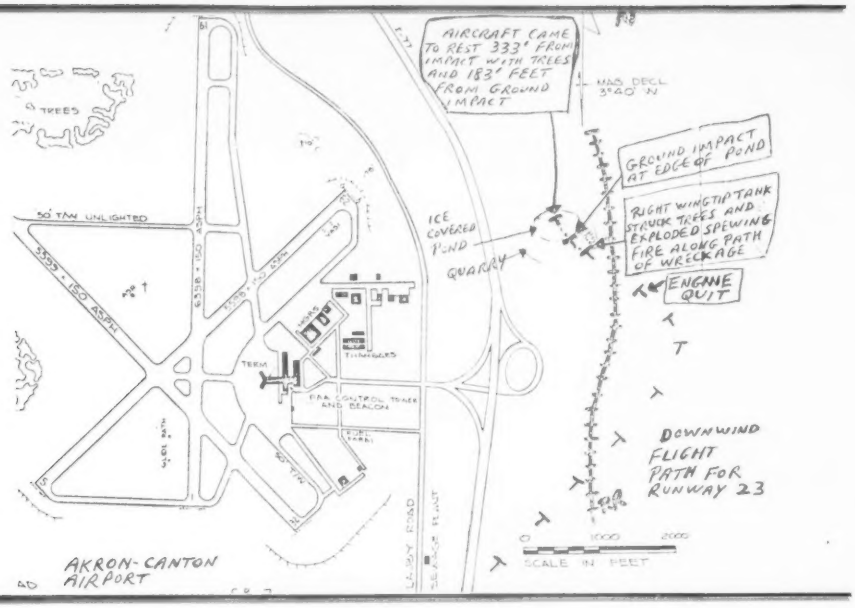
At 2:45 a.m.—32 minutes after his first mayday call—the pilot reported the airport was in sight and turned on his landing light, which the tower acknowledged seeing. In the plane the young men who had been tensely silent during the past quarter hour, breathed a sigh of relief, as did those in the tower. The ordeal appeared over, but the end was not yet in sight.

The pilot was given the wind (240 degrees at 14 knots) and a choice of runways. He chose Runway 23. It was farther away, but with an iced airplane and slick runways he believed he would be better off with the most favorable winds for his landing.

He planned his downwind leg close and kept a sharp eye on the airspeed indicator. An iced up airplane has different stall characteristics. Airspeed was about 115 knots and he *had* managed to ease his altitude up to about 200 feet above the ground, but the controls were very stiff; he could hardly move the yoke at all. He would have to fly carefully to get it on the icy runway.

He banked gently to turn on to a left base that paralleled a railroad track. He could see the dual lanes of Highway 77 which were between him and the airport.

Suddenly, without any warning, there was a clunk and the engine quit dead. For an instant he considered trying to get it onto the highway, but there were wires and poles and a surprising number of cars for that hour of the night. Through the snow-


AIRCRAFT CAME TO REST 333' FROM IMPACT WITH TREES AND 183' FEET FROM GROUND IMPACT
MAG DECL 3°40' W
GROUND IMPACT AT EDGE OF POND
RIGHT WINGTIP TANK STRUCK TREES AND EXPLODED SPEWING FIRE ALONG PATH OF WRECKAGE
ENGINE QUIT
ICE COVERED POND
QUARRY
TREES
50' TWY UNLIGHTED
3999 x 150 ASPH
6358 x 150 ASPH
TERM
FAA CONTROL TOWER AND BEACON
DOWNWIND FLIGHT PATH FOR RUNWAY 23
SCALE IN FEET
AKRON-CANTON AIRPORT
LIBBY ROAD

Aircraft was in sight of the airport when the engine stopped for good. An ice-covered pond in a quarry, located almost under the flight path on base leg, offered a fortuitous open space for getting the Cherokee down. Aircraft diagram was made by accident investigator.

flakes that streaked by in the glow of the landing light he could see that there was some kind of snow-covered clearing ahead, just beyond some trees. It was his only choice. By the time he realized the "clearing" was a frozen pond he was committed. He could only pray that the ice was strong enough to hold them. He wrestled with the controls, trying to miss the trees that were between the airplane and the pond. Then the right wingtip hit a tree trunk and the outboard fuel tank exploded with a blinding flash. *Would the entire plane go up in flames?* It did not. It hurtled on, and 150 feet farther struck the ground at the edge of the pond, shearing off the landing gear and skidding out onto the ice where it came to a stop 333 feet from where it hit the tree. Fortunately the ice did not break.

"Get out! Get away from the airplane!" The pilot's instructions were hardly necessary; as the aircraft slid to a stop the six seat belts clicked open almost with a single sound, and the nimble young men were out and running in less time than it takes to tell. From the edge of the pond where the aircraft had impacted the ground all the way back to the tree that had been struck by the wingtip there was a string of small brush fires, but they did not seem to be spreading. Apparently most of the fuel from the ruptured tank had been consumed aloft in the explosion.

While the youths waited to see if the *Cherokee* might yet explode they stomped out the nearest of the fires with their shoes. Wet snow was still falling and the temperature was a chilly 26 degrees. Finally, with no sign of fire from the airplane, the six made their way cautiously back over the ice to the crumpled bird. The rotating beacon was still blinking brightly, and as they approached they could hear the wail of the ELT coming over the radio which was still tuned to 121.5. They turned off the switches and were removing the luggage and Christmas presents from the *Cherokee* when the airport emergency equipment screamed onto the scene.

Miraculously, none of the victims were seriously injured, although all were taken to the hospital to be checked over. After that, and after they completed the formalities of making statements on the accident to the police and FAA, they continued their holiday journeys homeward, via a scheduled airline.

Later, after daylight, investigators arrived at the accident site. As they edged out on the pond they could hear the ice creak beneath their feet. It held, but barely.

The fuselage of the aircraft was intact, but badly damaged. The skin was wrinkled, the landing gear had been sheared off, and the propeller was grossly distorted. The right wing had been demolished by the explosion and the left wing was battered, but in one piece. The left tip tank was still full, the left main tank half full. The aircraft records were all in order, as were those of the pilot.

The investigation turned up nothing that would have prevented normal operation of the engine, but it was noted that meteorological conditions, particularly in the clouds, provided the low temperatures and moist air that is conducive to carburetor icing.

The National Transportation Safety Board in its official finding described the "accident type" as "engine failure or malfunction; collided with trees." The NTSB's probable causes included "continued VFR flight into adverse weather conditions" and noted that powerplant and powerplant controls had been improperly operated (this could include carburetor heat) and that weather conditions had been conducive to carburetor ice.

The two inspectors from FAA's Cleveland GADO who participated in the post-accident investigation agreed that it was a near-miracle that no one had been killed in the accident. Most pilots caught in snow and ice are not so lucky, and this type of incident is not unusual in the areas bordering the Great Lakes. Attempting to fly VFR over the top of storm clouds, especially in winter, is a risky business at best, and at night is even more hazardous. Many a pilot has accidentally flown out of the dark night directly into a black cloud, or deliberately entered clouds without anticipating a change in the weather. *Cautious pilots never fly over the top of anything they—or their aircraft—coud not handle if they were unexpectedly plunged down into it.*

Some conscientious Christmas angel had its hands full that snowy December night, performing all the miracles needed to save Christmas for the six boys and their families. There was engine failure to cope with, and structural icing; IFR weather to be negotiated by a VFR pilot; a vibrating propeller (that could have shaken the airplane apart) to be reckoned with; radio towers to be avoided; a fiery fuel explosion threatening to engulf the airplane in flames. There was the scared teenage pilot to be helped in handling frozen controls in the dark, and the thin ice on the pond that might not have supported a hard crash landing.

One more invitation to disaster might have proved too much for even the brightest Christmas angel to overcome. *Don't push your luck.*

(Note: Certain details of this accident have been altered in the narration to preserve anonymity.) ■

Famous
Flights

Designer Henri Mignet—"I wish to build an aircraft so simple a child could fly it." *Right*—Henri about to demonstrate the *Flea* to a crowd in Britain in 1934.

THE FLIGHT OF THE FLEA

Some people said he was a mad Frenchman, others thought he was an aeronautical genius, and some dismissed him as a hopeless romantic.

But one thing is certain about Henri Mignet: he was one of the earliest pioneers of homebuilt aircraft, and for a few years in the 1930's he nourished the hopes of thousands of Walter Mitty types who dreamed of building and flying a crash-proof airplane.

Mignet's concept was beguilingly seductive: he said that the average person with minimal mechanical ability could build his own plane more efficiently, more simply, and more economically than an aeronautical manufacturer. "If you can nail together a packing case you can construct an airplane," he said.

And Henri Mignet did indeed construct an airplane with his own untutored hands. He tested it successfully in France, flew it across the English Channel, and soon he had hundreds of ordinary people all over the world building their own Mignet-designed airplanes.

Mignet's concept was beguilingly seduc- during World War I. A graduate of the Bordeaux School of Electricity, he had been drafted into the French army, serving in a signal unit. When he first saw airplanes being used in combat he became fascinated with the whole concept of heavier-than-air flight. During his free hours he would slip away to a military aerodrome, making friends with the mechanics and helping them with their chores. A friendly sergeant finally allowed him to climb into the cockpit of a SPAD Scout to taxi it around for a few feet. But the young Frenchman, once behind the controls, let his enthusiasm run away with him, and he pushed the throttle forward attempting to get airborne.

That initial flight ended quickly as the SPAD flipped over on its back. The angry sergeant clipped him on the ear and sent him back to his signal unit, telling him that the aerodrome was now off limits to him.

Mignet's flying career was over for a while, but that one experience had fired his enthusiasm to the boiling point. "I *must* possess wings, live in a cockpit, experience again the atmosphere of that military squadron," he wrote to a friend. During the decade following the war he spent most of his spare time trying to build a workable airplane in his own back yard. He designed seven different models, all without success. The best he was able to achieve was a noisy and ungainly monoplane which could only taxi around a pasture.

He had read a vast number of books on aeronautics and he ultimately came to the conclusion that something was amiss with the basic design of contemporary aircraft. Like so many aviation dreamers over the years he believed that the "pure flight" of birds was the ideal model. There were too many controls on the man-made airplane, he concluded, confusing the pilot and encouraging the airplane to spin in flight. Recalling his own misadventures with the SPAD, he wrote: ". . . I had the accident not through my own fault, but because the whole conception of the ordinary airplane was wrong."

In his designs of the late 1920's he became obsessed with constructing an airplane with maximum stability, eliminating the horizontal stabilizer, elevator and aileron controls. He reasoned, by a rather twisted logic, that an airplane which could not be intentionally banked would never spin. Removing the horizontal tail surfaces, he reasoned, would simplify pitch control for what he called "the totally stable airplane."

By 1928, with his eighth design, he was finally able to build a single engine monoplane which could get off the ground for a few feet. It was hardly a sensation, but when he published an article in a French aviation magazine entitled, "Is Amateur Aviation Possible?" he ignited a wildfire of interest in this subject.

It was 1928, the year after Lindbergh had taken his place in the ranks of popular heroes. Thousands of persons from all parts of the world responded to Mignet's article. Many were scufferers, but the majority believed passionately in Mignet's concept of the totally stable airplane, a safe but exciting vehicle which could be inexpensively constructed at home by amateurs.

For another five years Mignet worked on his design, building six more models in the process, until in 1933 he felt he had at last achieved his goal with the HM 14. He called it the *Pou du Ciel*, which means *Sky Louse*, so named, Mignet said, because it was "a small insect which made people scratch their heads."

The *Sky Louse* was a stub-nosed little biplane 11 feet 6 inches long with a top wing span of 20 feet and a lower wing of 12 feet. The top wing was moveable and positioned foreward of the pilot, while the lower wing was fixed and aft of the pilot. The most radical thing about the *Sky Louse*, however, was the simplicity of his control

system. Following his cherished belief, there were no rudders. The only control was the stick, which operated both the rudder for lateral control and the rotatable upper wing —for pitch control. No pedals. Mignet said that in his airplane ". . . the pilot could stamp his feet to keep them warm." He estimated a cruising speed of about 62 mph.

The cost factor, though, was Mignet's proudest achievement. He used plywood and canvas and wire and an inexpensive 20 hp engine. For about $250 to $450 (in depression dollars, that is) anyone could build a *Sky Louse* in his backyard, Mignet claimed.

To publicize his airplane he wrote and printed a book at his own expense entitled, *Le Sport de L'Air*. Like his earlier article, it caused an immediate and widespread reaction. In 1934, the book was translated into English as *The Flying Flea*—the British apparently found the word louse somewhat offensive and they always called Mignet's airplane either the *Flying Flea* or simply the *Pou*. The English edition of 6,000 copies printed by the Air League of the British Empire sold out within a month.

The craze for the *Flying Flea* was on.

In 1935 and 1936 it is estimated that over 500 *Fleas* were built in France, and another 600 were under construction in Britain. *Pou* clubs were organized in England, and a *Flea* was put on exhibit in the famous Selfridge's Department Store in London.

Fortunately, most of the *Fleas* under construction never did get off the ground, mainly because the amateur builders hastily hammered them together without precise work necessary for an airplane. But a number of them did actually fly, and the few enthusiastic reports of those amateur builders only gave greater impetus to the craze. One English preacher even reported that he had gotten his *Flea* up to 12,000 feet, although Mignet himself said that the highest he had ever flown in one of his airplanes was 6,000 feet.

Already somewhat of a celebrity in England, Mignet became a virtual folk hero in the summer of 1935 when he made a triumphant flight across the English Channel from Calais to Lympne in his *Flying Flea*. He was feted in England, and performed exhibition flights with his airplane before huge crowds. It was the high point of his aviation career, because soon the *Flying Flea* was to nearly disappear from the aviation scene.

In the spring of 1936 the British Air League's test pilot was killed in the crash of a *Flea*, following an apparent stall and loss-of-control. Five similar fatal accidents had been reported in France, and by the Summer of 1936 a total of 11 fatal *Flea* loss of control accidents were on record.

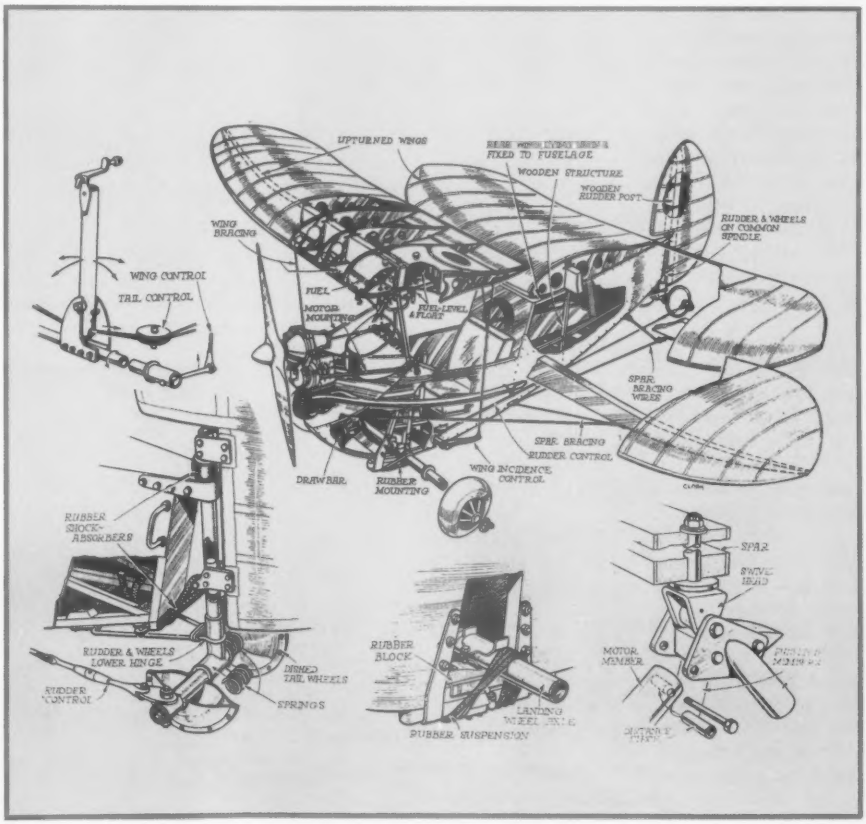
At this point both the British and the French governments became concerned about the safety of Mignet's design. In 1936 wind tunnel tests were made at Farnborough, England, while in France similar tests were conducted at the Aerodynamic Research Center at Chalais-Meudon. These tests revealed what was described in the Press as "a fatal flaw" in the *Flea's* design. In normal flight at positive incidence the *Flea* was apparently both stable and controllable, but if a certain negative angle of incidence were achieved the *Flea* would go into an uncontrollable dive. That angle could be caused by a sudden down gust or by a rapid push on the control column. This fatal characteristic was aerodynamic interference between the upper and lower wings. When the trailing edge of the upper (forward) wing of the *Flea* was tilted down, the airflow and the lift on the lower (rear) wing was increased, producing a nose-down dive which took the pilot straight into the ground. The ability to control the angle of incidence, unique to Mignet's design and the vital "heart" of his control system, introduced a unique and unsuspected problem.

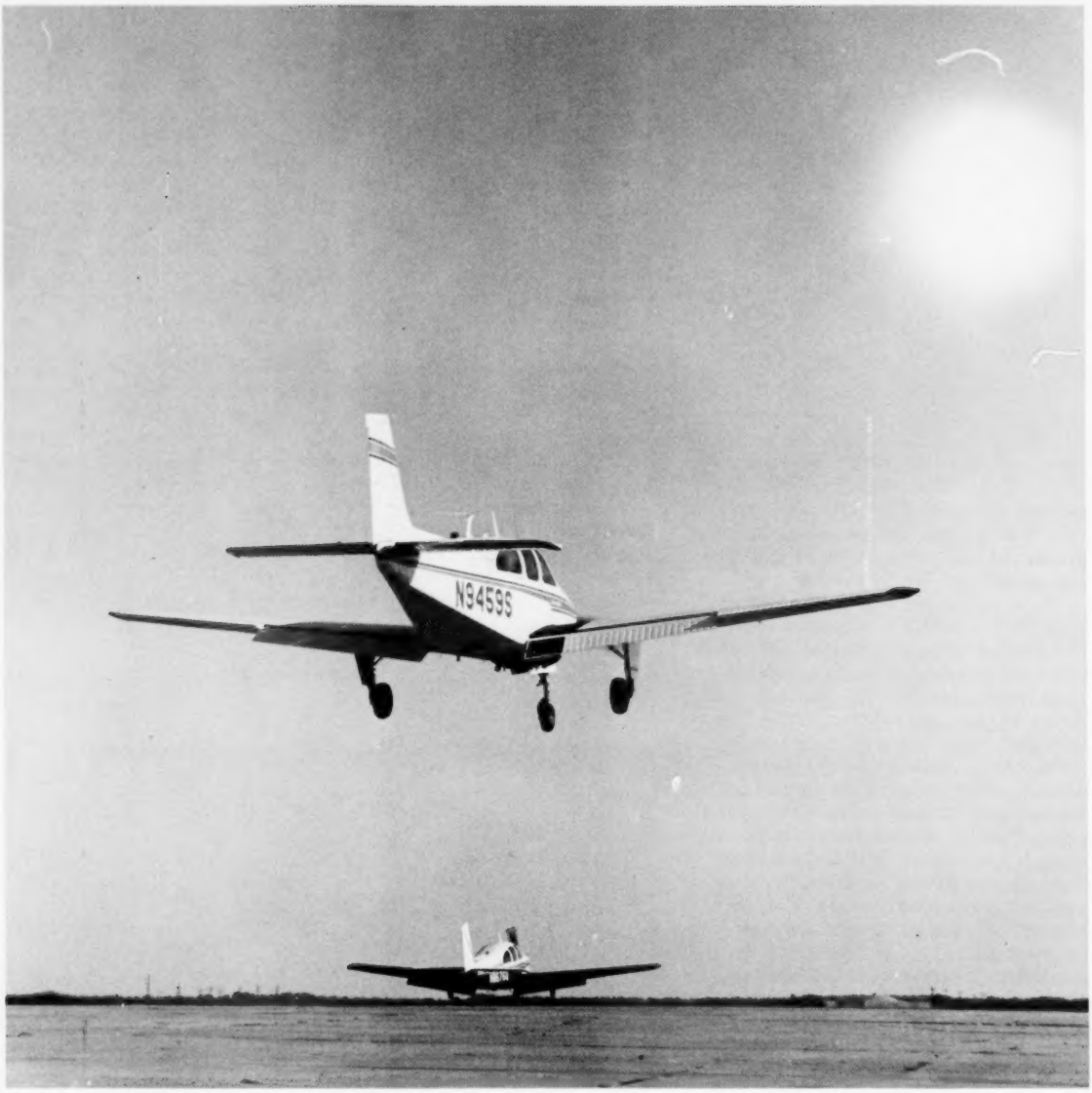
With the release of these test results, "*Flea fever*" came to almost an abrupt halt in Europe. There were some attempted "fixes" made on the *Flea* by articulating the rear wing, and a few more were built over the years, but the rage among homebuilders disappeared as rapidly as it rose. Mignet himself, who was never seriously injured in any of his aircraft, stubbornly defended the safety of his design and continued to experiment and construct new versions of the *Flea* until his death in 1965.

In the United States, however, the concept of a "two-control" aircraft with a pivotal wing continued to interest builders of amateur and experimental aircraft. The introduction of wing struts to lessen the likelihood of inadvertent incidence change from gusts, and better understanding of the flight characteristics of this type of aircraft gave rise to a continuing production of latter day designs of the original Mignet aircraft. Conceivably this could ultimately result in a new homebuilder's dream of a plane that is as simple to fly as an elevator. But for the moment Henri Mignet's fame rests more on his success as a publicist in helping to launch the amateur built aircraft movement than on his ingenuity at the drawing board or in the hangar.

He did set a lot of people to scratching their heads. ■

Details of the homebuilt "dream plane" with pivotal upper wing.





Taking off or flying into the sun reduces your ability to see other aircraft, especially in haze, or when the windshield is scratched.

THE OMNI PRESENT EYE

How can the pilots of aircraft on an opposing course fail to see each other?

(Editor's note: the first article on this subject, in the October 1976 issue, established the point that the majority of midair collisions in general aviation flying no longer take place in the traffic pattern—as noted in earlier years, but are now occurring at any point in the flight. The present article discusses certain kinds of flying which have figured prominently in midair accidents.)

In the overall picture of general aviation flying accidents, instructional flying accounts for a rather modest percentage of the serious accidents. But surprisingly enough, instructional flying is currently involved in virtually *the same number of midair collisions as personal flying*—the category which is responsible for the greatest number of accidents of all kinds. A National Transportation Safety Board study of midair collisions (from 1971 through 1974) tallies 63 accidents involving pleasure flights, 64 accidents involving instruction, and 9 accidents involving practice flying. Flight instruction or practice appears to be an activity which may distract or absorb pilot's attention to the point where he fails to maintain a safe separation from other aircraft.

The many years of experience which instructors accumulate would seem to be pretty safe insurance against such a pilot allowing a plane under his command to collide with another. But the laws of coincidence, which appear to operate in bringing aircraft to the same spot in the sky at the same time, are not respectful of age or experience, as indicated in the following example:

The instructor who departed Hyde Field, Md., on the afternoon of September 26, 1974, had over 30 years of flight experience, beginning with his cadet days in World War II and totalling some 20,000 hours. He had logged over 5,000 hours in the Cessna 172M he was flying, and he was thoroughly familiar with the area, which includes portions of Prince Georges and Charles Counties, south and east of Washington, D.C. and near Andrews Air Force Base. The weather was clear and bright with unlimited visibility. The student, occupying the lefthand seat, carried out a simulated instrument departure and wore a hood throughout the flight.

Airborne at 3:00 p.m., they proceeded in a southwesterly direction toward Brooke VOR, where they intended to practice holding procedures. They were climbing out to level off just under the 1,500 "floor" of the Washington National Terminal Control Area. Their heading was 225 degrees. The sun, which was still high and off to his right, bothered the instructor pilot somewhat, but ". . . not greatly."

Some 15 minutes before the Cessna took off, a Cherokee *Archer* departed from Maryland Airport, a small private field at Pomonkey, Md. The pilot and sole occupant was a German engineer, working in the United States temporarily on an exchange program. He had logged a total of 54 hours in the aircraft, and had received his private pilot's certificate only 30 days previously. After making a touch and go landing at Pomonkey (about 15 miles south of Washington National Airport), he flew west toward Indian Head, a peninsula on the Potomac River less than five miles distant. He then took up a northerly heading and followed Highway 225 past his airport of origin. At the point where Indian Head Highway widens from two lanes to four lanes, over Piscataway Creek, he intended to turn around and fly back to his base. His altitude was just under 1,500 feet. His heading was ". . . between 30 and 40 degrees."

As the *Cherokee* pilot was studying the road he suddenly felt a sharp bump in the area of his left wing, and he thought he may have caught a glimpse of another aircraft below him. He circled around but saw no one. He then observed a hole in his left wing where the landing gear strut cap should have been, and he realized that the entire strut was gone. He thought that his plane must have been buffeted by turbulence which somehow damaged the (fixed) landing gear, so he radioed the airport manager at Pomonkey and arranged for him to look over the landing gear as he made a low pass over the field. The airport manager confirmed that the left strut was gone; the right and nose wheel structures appeared to be intact.

The pilot was then instructed to circle the field for the next hour, burning off enough fuel to minimize the danger of fire on landing with the missing wheel. Meanwhile the local Fire Department foamed the runway heavily. On landing, the *Cherokee* pilot was able to hold the left wing up with aileron long enough to dissipate most of his speed and to bring the aircraft to a halt without so much as scratching the paint. He suffered no injuries except a painful gasping for breath as he emerged from the igloo of foam piled upon the cabin. He found it difficult to believe the news that he had been involved in a midair collision.

In point of fact, his landing gear had torn away a five foot outboard section of the wing of the Cessna which had left Hyde Field on an instructional flight. The aircraft was thrown violently down into a spiral, and the instructor was momentarily dazed by the force of the impact. Then he became aware of pieces of the wing whirling past, and he knew that there had been a collision. He sensed immediately that the aircraft was in a diving spiral, and that the ground was not far away. With power and backpressure he was able to level off in time, but he found that he needed to hold full right rudder and right up aileron to keep the plane from rolling to the left—because of the shorn left wing. He wanted all the help he could get on landing, and his best bet appeared to be Andrews Air Force Base, about eight miles to his right. A hastily radioed "Mayday" to the base set all the emergency wheels in motion—runway cleared, ambulances, doctors, fire trucks standing by.

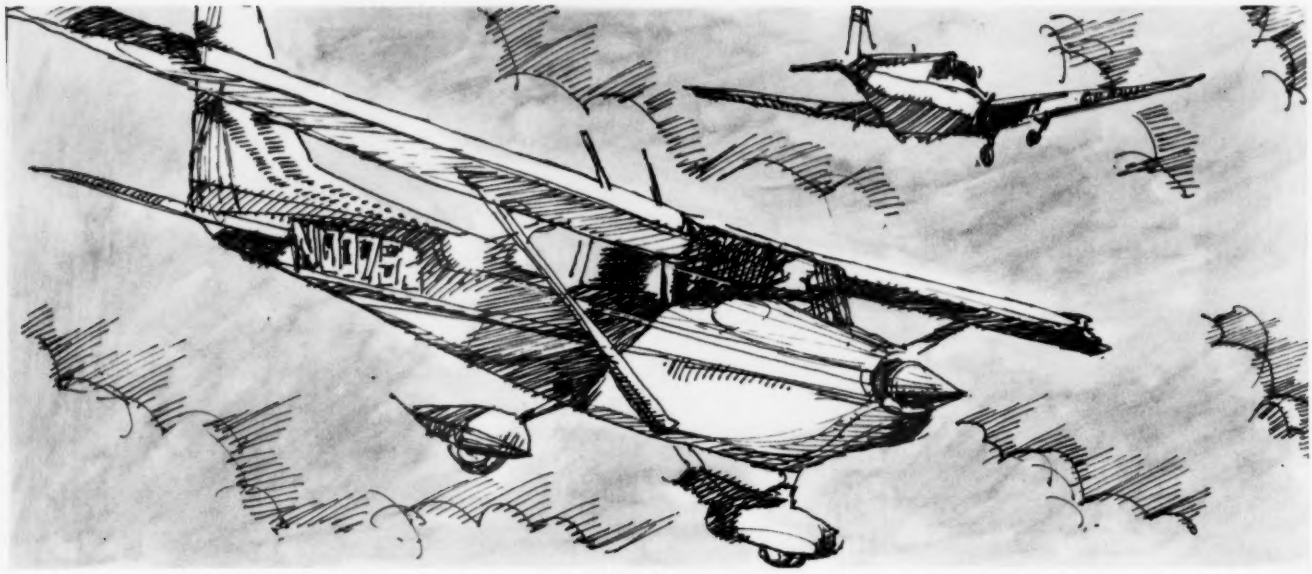
His immediate problem was turning the aircraft in the direction of the runway. A left turn meant risking a stall and spin; the best he could manage in the way of a right turn was an agonizingly slow one degree per minute. He had no idea how long the damaged wing would hold together. (There was barely enough wing surface remaining to sustain the aileron hinge.) To avoid any chance of a stall he kept the airspeed up over 100 mph until he crossed the threshold of the 7,500 foot runway. His student, after the first frantic moments when the aircraft was out of control, sat tense and silent in his seat.

The instructor used full power to level the aircraft over the runway, held it off with power until the main wheels were less than a foot over the concrete, eased off 200 rpm, and the *Skyhawk* settled gently on the foamed surface.

Seconds later the two airmen were surrounded by red lights, screaming sirens and shouting people.

The fact that all concerned with this mid-air accident escaped injury was due in part to good flying, but also to sheer luck. The wings of the two aircraft had passed within 18 inches of each other. Neither pilot (they later met and shook hands solemnly) had any idea how they could have missed seeing each other's aircraft. Both felt that they were maintaining adequate surveillance for traffic. Yet the accident occurred, and the National Transportation Safety

A student wearing a hood can block off a great part of the sky. It is up to the instructor to set up a system of watching for other traffic.



There is no greater shock to a pilot than to feel a jolt and see parts of the airplane tumbling down around him.

Board investigation determined that both pilots were responsible for failing ". . . to see and avoid other aircraft." The estimated horizontal convergence angle was 165 degrees—the vertical convergence angle was only 7 degrees.

How had they failed to see each other?

In 1975 the Board reported on 10 midair collisions involving at least one flight instructor. Half of these accidents took place well away from the airport environment in good VFR weather. The worst collision took place between a light trainer and an air taxi: all persons on board (14) were killed. Again, the cause given was failure to see and avoid other aircraft.

The instructor is a professional pilot in whom the flying public has great confidence. What can he do to reduce the possibility of a midair collision during instruction or practice?

The key to spotting and avoiding other aircraft in flight is *scanning*. Scanning is not merely looking around when you are not busy or tired; it is a learned procedure performed at regular intervals *appropriate to the environment* — i.e., in marginal weather, or in dense traffic, the intervals must be relatively short.

There is no single scanning technique that is ideal for everyone. Some pilots prefer to scan from left to right, others from right to left; some move their head steadily through each quadrant; others move from segment to segment of the windows diagonally or vertically. The best scanning technique is that which performs the most effective search of the sky around you in the least amount of time.

Staring, incidentally, is not an intense form of scanning. Tests have shown that it is possible to stare out of a window for 10 to 20 seconds and not see several aircraft on a possible collision course. Your vision is sharpest when you move your eyes from one object to another, such as cloud forms, or land features, rather than when you simply move your eyes mechanically over a given area. Tests have also shown that the human eye may have difficulty holding an infinity focus at distances greater than one mile, especially when there is an "empty field." *Altitude myopia* is the name given to the tendency of eyes under these conditions to fail to distinguish objects in the distance. The presence of haze, which is very common almost everywhere in the United States now, accentuates the problem (See "Hazy Daze" in the July 1975 issue of FAA GENERAL AVIATION NEWS).

Instructors can minimize the danger of midair collisions by conscientiously teaching the art of scanning—and practicing what they preach. Many students rely so heavily on the instructor's capability that they do not bother to scan on their side of the aircraft, especially when they are busy handling an unfamiliar aircraft and absorbing new information. This kind of reliance can become a habit—a dangerous one, both for dual and solo practice. All-around scanning is sometimes quite difficult for an instructor with a student seated beside him, especially if the student is a large individual sitting in a small airplane, and blocking much of the view to his side. Under these circumstances it is important for the instructor to "clear the air" on the student's side with appropriate turns at regular intervals, even if this means interrupting a practice procedure.

Cockpit visibility can also be hampered by dirty or bug-specked windshields. Bug specks can easily be confused with other aircraft at a distance. The instructor can go a long way toward impressing his student with the importance of good visibility by making the condition of the windows a part of every preflight inspection. If the windows are dirty and no line attendant is available to clean them, the instructor can set a good example by doing the job himself, or with the student. The time "lost" from actual flying may be considered a valuable part of the lesson.

Sun glare is a factor frequently mentioned in the investigations of midair collisions. Flying toward the sun significantly increases the difficulty of spotting other traffic, even when the best of sunglasses are in use. The instructor whose attention is partially absorbed in the lesson he is giving does not need this kind of handicap. The position of the sun should be considered when planning a flight lesson, particularly when the student is inexperienced, or is flying under a hood. Some veteran instructors make a point of demonstrating the problems associated with seeing and handling the aircraft when flying into the sun to a student—and the means of avoiding it.

Eye protection is important. The instructor is in a good position to impress the student with the importance of having and using high quality sunglasses. Unprotected eyes fatigue more readily from glare, and fatigue is a notorious contributor to accidents. Pilots should know the percentage and kind of light transmitted by the glasses they select. The green filter found in many sunglasses blocks out 75 percent of visible light and 90 percent of infra-red light, but some distortion of color in landscapes will take place.

Many pilots use sunglasses with neutral tint filters with a medium density filter that absorbs equal amounts of all wave lengths of light, and can therefore reduce light intensity without changing or distorting colors.

Polarized sunglasses are sometimes used in conditions of unusually strong glare. A polarized filter will transmit light vibrating in a given direction and absorb the light vibrating in other directions. When used

with sunglasses, polarized filters are combined with a colored filter, and usually block out about 70 percent of light energy. Polarized glasses are particularly effective in reducing glare reflected from bright surfaces. However, polarized sunglasses are not recommended for flying in aircraft with electrically heated windshields, since the heat pulse in the windshield may become visible as a flicker sensation, and cause dizziness or vertigo.

Another type of sunglass sometimes used in flying is the so-called "one-way" glass, which has a reflective coating, usually a mixture of chrome and nickel. The coating will reflect most—but not all—of the available light. Such lenses have a mirror-like appearance. The density of the reflecting mirror determines the amount of light transmitted. "Graded density filters," which use stronger filters in the upper or lower third of the lens (or both) are sometimes advantageous for certain conditions of glare from several directions.

Sunglasses which transmit from 10 to 15 percent of the light are probably best for ordinary flying. Lenses with lower transmission of light are recommended only to combat the glare found at high altitudes. At lower altitudes they may not transmit enough light for the most effective scanning. Some of the curved styles in eyeglass frames may be hazardous if they interfere with peripheral vision—and peripheral distortion is more evident with an increase in the size of the lens. Glasses which are shatterproof are best.

Checklists. The importance of using checklists for various stages of flight cannot be overemphasized, but the student needs to be taught how to work through a list without "burying his head in the cockpit," or leaving the scanning entirely to the instructor. The format and condition of the checklist has something to do with the problem. If the print is minute, or the sheets dog-eared or smudged, more time will be required to go over the list. Some pilots who are particularly concerned about keeping their eyes up front use a panel-mounted scroll type of checklist which can be read without bending the head or lowering the eyes. The scroll is rotated progressively, so that if the pilot's attention is diverted by the presence of other traffic, or radio calls, he never loses his place.

No one wants to worry a student to the point where he is so concerned about other aircraft that he cannot learn to fly his own. The degree of responsibility for scanning expected of a student is a matter of instructor's judgment, but it should be clearly indicated and steadily reinforced. The most valuable instrument every pilot must learn to rely on is his own eyes.

(Part three of this series, in the January 1977 issue, will discuss the role of Air Traffic Control in preventing midair collisions.) ■

BRIEFS

GAS PAINS. FAA continues to caution pilots against using automobile gasoline in aircraft engines and has recently issued an order to FAA Flight Standards personnel reinforcing this position. The order notes that specifications for auto gas do not control certain properties that are important to aircraft engines; that state requirements for automotive gasoline vary greatly, and in fact 14 states have no requirements for automobile gasoline. The FAA order declares that ". . . the use of 'automotive' gasoline in aircraft or airplane engines is prohibited. Supplemental Type Certificates may not be issued for such operations. This does not preclude the use of automotive fuel for research and development projects in aircraft certificated Experimental for that specific purpose." Nor is the order intended to apply to those homebuilt and other experimental airplanes powered by converted automobile engines.

■ DOTS AND DASHES. Pilots are once again reminded of the importance of making positive identification of NAVAID frequencies such as VORs and ILSs before using them for navigational purposes. Always considered a wise pilot habit, this precaution assumes added significance in the face of recent reports of NAVCOM interference by powerful commercial FM broadcast stations. The FM signals can block air/ground communication and mask VOR/ILS identifiers and also cause erroneous needle indications in some cases. When FM broadcasts are interfering with avionic reception they can be heard by turning up the volume. Following a strict procedure of listening to station identification when changing channels may help you avoid making navigational errors during flight.

■ A WEIGHTY PROBLEM. It is not safe to assume that every passenger on board your airplane is of a standard weight, nor to automatically calculate your weight and balance on that basis. One Midwest pilot learned this lesson the hard way when he ended up overshooting the runway on a single-engine air taxi flight, then hitting trees and crashing, and finally having his commercial certificate suspended for 90 days by FAA. NTSB, to whom he appealed the action, agreed with the penalty and pointed out that the airplane was some 127 pounds overweight at the time of the accident. In his defense the pilot stated he had used an average weight of 165 pounds per occupant in computing the aircraft gross weight, although two of the three passengers weighed 225 pounds each and the operator's manual instructs that "actual weights" should be used for passengers who obviously do not conform to the standard average weight.

■ POOR MIXERS. High altitude flyers who use oxygen are cautioned that oil-based preparations used on the face may cause burns if exposed to oxygen. Many cosmetics and lipsticks and also lip pomades designed to prevent skin chapping contain such oil.

PARIS OR BUST. A crossing of the Atlantic Ocean by balloon was almost achieved last month when Ed Yost, a 57-year-old balloonist from Sioux Falls, S.D., dropped into the sea off the Azores, just 600 miles short of the European continent. Yost survived the landing, and his flight set new records for endurance (107 hours) and distance (2,520 miles).

Yost had lifted off from Baldwin's Head, Maine, on October 5 at 6:10 p.m. in the helium balloon which he had spent two years building at a cost of over $100,000. He carried three month's supply of food, a life jacket, airline radio and other survival equipment in the gondola, which was designed to double as a catamaron-type sailboat, in case he went down in the sea, or as an igloo, if he went down in the Arctic. During four and a half days aloft he constantly maneuvered the balloon to get the best winds—letting helium out to descend and tossing out ballast to rise. By early morning of October 10, when progress beyond the Azores was blocked by contrary winds, Yost advised listening airline pilots that he was ditching, and shortly thereafter he was rescued by a German freighter.

Yost, who has been flying airplanes and balloons for 37 years, holds a commercial pilot certificate with multi-engine, instrument and balloon ratings, and also an A & P mechanic certificate. Balloon flight over the ocean is considered very risky, and several recent attempts have led to failure and fatal consequences.

FAA Will Release Complete List of Exam Questions

New study guides for airman written examinations will include a booklet containing a complete list of possible test questions (600 to 1,000 depending on the test) along with multiple choice answers. In the past, written examination guides which have been available to pilots and flight schools contained recommended study material references and a short sample test, but the actual questions used on the tests were not made public.

However, during a recent Federal court case the judge found the tests to be in the "public domain" and said he believed they should be available to the public much the same as the tests for bar admission. FAA agrees that the sale of test booklets will provide a valuable learning tool for students and instructors. A student who knows the answers to all 600 or 1,000 questions in the booklet should be more knowledgeable on the subject than in the past. During the actual test the student is given a list of 10 to 150 (depending on the test) randomly selected questions to answer.

Going public with the test questions eliminates the expensive and cumbersome security procedures formerly needed for shipping, storing and administering the examinations. First of the new written exam guides, that for Airline Transport Pilot, will be available early in 1977. Others to follow shortly thereafter are for Parachute Riggers; Private and Commercial Pilot; Flight Instructor; Flight Engineer; and Airframe and Powerplant Mechanic.

Test guides will be available from U.S. Government Printing Office and at government bookstores. Prices have not been announced.

PIREP Format is Standardized

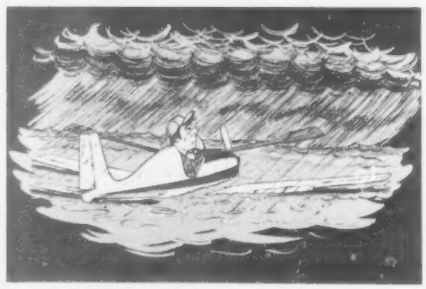
A new standardized and coded format for pilot reports (PIREPS) which is now in use should make reading and relaying of PIREP data easier and quicker for weather briefers and those pilots who make personal visits to flight service stations for weather briefings. The new format is also expected to be more adaptable to automated storage and dissemination on the nationwide teletypewriter network.

In the past PIREPS were handled informally. When pilots called in weather reports they were copied and relayed in whatever order they happened to be given. Under the new system, pilots may or may not follow the standard format when giving PIREPS, but in any case they will be put into the standardized form by the ground personnel receiving them. The two-letter codes and the order in which they are used is: OV (location); FL (flight level); TP (type of aircraft); SK (sky cover); TA (temperature); WV (winds); TB (turbulence); IC (icing); RM (remarks).

New Instrument Landing Systems

A recent FAA contract provides for 122 instrument landing systems (ILS) to be installed within the next three years. More than half of these will be partial ILS systems, going into service at airports which do not have ILSs.

The balance will be full ILS systems. The full system includes localizer, glide slope and two marker beacons; partial systems include either a localizer or a glide slope and one marker beacon. The glide slope and marker systems will be added to locations already having localizer/marker, to provide full ILS capability. FAA presently has 542 full and partial ILS units in service at 409 airports.



SAFETY SOFT-SELL. FAA's Great Lakes Region is using the television "commercial" concept to sell safety to watching pilots by means of 10 and 20 second accident prevention messages accompanied by color cartoons which use a light touch to depict common flying hazards. The public service announcements, which will be changed with the seasons, are intended to augment the agency's basic accident prevention program (pilot clinics, etc.). First three of the "gentle reminders" relate to structural icing, mountain flying, and lake-effect weather (shown above).

• The Throat Mike

The brief in the July issue regarding "Cockpit Distractions" was quite enlightening. The need to hunt for and hold the microphone on takeoffs and landings is always quite an accomplishment, where three hands would be welcome. I've recently acquired a World War II type of "throat mike" which I am hoping to put to use, just as soon as I can get the necessary "hook-up" made for me. Why have these makes disappeared over the years? Are they acceptable for use under today's FAR's? If so, can someone quote me on the cost of the hook-up? I'm really looking forward to replying at any time simply by pushing a button and talking!

Raphael J. Janer
Hollis, N.Y.

There is nothing in the regulations that prohibits the use of the throat-mike you describe. However, you may have a problem getting the hook-up since older type plugs are not always compatible with the connections on the transmitters now in use. On the other hand there are quite a few "boom-mikes" on the market which would give you the same capability of "hands-off" talking, and some are quite reasonable (under $50.). Your aviation radio shop should be able to advise you further.

• Vital Actions

With regard to "Vital Actions" in the July 1976 issue, I appreciate you were working from data supplied by someone else, and you were out to emphasize a particular—and valuable—lesson; however I must point out some possible critical flaws in your supporting case study. You state that,

"In his haste to depart the pilot had not taken the time to observe that it (the fuel selector valve) remained on 'right'; he assumed he was drawing from the full (left) tank on takeoff, so that when the engine began to misfire at a critically low altitude, he saw no reason to switch to the alternate tank . . ."

The other evidence presented in the case notwithstanding, is it not possible that the pilot did take off on the left tank and for some unexplained reason (not all post crash examinations are perfect) one or both engines misfired and quit? One desperation move would be to go to the RH tank, would it not?

Similarly, the criticism of the pilot's judgment on trying to return to the field seems to have neglected the witness-derived fact that the engine 'failure" was not a sudden, complete power loss. This kind of variable complicates the pilot's decision process. Assuming an intermittent power situation, what is the "standard procedure for establishing control of the aircraft, "besides the obvious need for maintaining airspeed? Wouldn't even the most qualified pilot turn back towards a runway and not attempt to take a "straight course and establish a normal glide angle" until after power was degraded appreciably?

C. O. Miller
McLean, Va.

Both of your points are well taken. We do not have unquestionable evidence that the pilot took off with the fuel selector on the empty tank, or that his decision to return to the field could not have been supported by the actual conditions of flight at the time. Since the accident happened at a distant corner of the globe, we chose to assume that the investigators had sufficient reason for coming to the conclusion they did.

The important point in the article was not the assignment of responsibility, but the need for having set procedures appropriate to an inflight emergency, in hand. This would be especially important for less experienced pilots.

• More on Vital Actions

Your July article "Vital Actions" emphasizes the importance of pre-takeoff checklists ("fuel selector-full tank") but surely misses the boat on low altitude/critical altitude engine failure procedures. When you are only 400 feet off the ground and your engine fails—you should *immediately set up best glide, while simultaneously finding a place to land!* If—and only if—time is then available do you try a restart checklist such as that shown on page 9 of your July issue. Your article and the inset checklist over-emphasize restart and under-emphasize the "controlled forced landing" procedure.

Of course it is true that had this particular pilot used the checklist in your inset he probably never would have had to complete any forced landing because he would have discovered the full tank of fuel. However, had he first controlled the aircraft for a safe forced landing, he and his passengers would be alive, and he may even have had time to try to restart too, thereby avoiding a forced landing.

Your heart is in the right place; it's just a matter of emphasis. Keep up the safety related articles—they are badly needed.

Robert W. Sutton
Fairfax, Va.

• Mismanagement of Fuel

The National Transportation Safety Board recently expressed concern over the increased number of general aviation accidents attributed to poor fuel management. I note also that the results of tests conducted by an aviation magazine found a wide range of error among fuel gauges in general aviation aircraft—a suspected contributing factor in fuel exhaustion accidents. I recommend that pilots eliminate the uncertainty of fuel gauge reliability and exact contents of the fuel tanks by utilizing a time-proven, simple device called a "dipstick." It is not difficult to customize a dipstick to any aircraft fuel system, and I am sure that the aircraft manufacturer or local aircraft inspector would be glad to help.

As a subscriber to numberous aviation publications I place two magazines on the top of my list which I do not trade or pass on, and yours is one of them. As a flight instructor I need current information on FARS and advisory circular interpretation, and I appreciate your indepth analysis of accident reviews and lessons to be learned from each one. I appreciate your Briefs and general articles and wish you continued success with your publication.

Edward A. Fritz, Jr.
North Hampton, N.H.

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFS-807, Washington, D.C. 20591.

• Getting Accident Reports

Is it possible to obtain an accident report from NTSB for a specific general aviation accident? If so, where do you write for it, and what is the cost?

Norman Fassler
Franklin, Pa.

Copies of accident records can be ordered by mail from the National Transportation Safety Board. Address your request to NTSB, Public Inquiries Section, 800 Independence Ave., Washington, D.C. 20591. Give the date, location and registration (N-number) of the aircraft involved. The charge is 25 cents per printed page, and if there are photos in the file they are available at $1.50 each for black and white prints (eight by ten inches) or $4.00 each for color prints. You are billed in advance; when your check is received the report is mailed to you.

• A Case of Pot

Regarding the letter from Salem, Oregon, in July about "dumb pilots" and your reply, I must point out that your excuse for your artist's being "old-fashioned" is as out of date as his caricatures of female pilots. To balance long-eyelashes and cleavage on female pilots, has he ever drawn pot-bellies or hairy chests on male pilots?

Donna Spontak
Berkeley, Calif.

Frequently.

INSTRUMENT CORNER

• No Contact

I enjoy your magazine very much—particularly the "instrument corner," and I have a question. When we fly IFR out here in the west there are occasional "voids" where radio and/or radar contact is not possible while flying at the MEA or even slightly above. Our usual instructions are to contact center on some frequency, and if no radio contact is made to try in 25 miles or so. This is fine when everything is normal. But what if, during this period of no radio contact, the pilot encounters an emergency condition that requires a course and/or altitude change (such as an extremely turbulent mountain wave, imbedded cell, severe ice, etc.)? Since there is no one to whom an emergency can be declared are there provisions in the IFR system to allow the pilot to do whatever is necessary to save the lives of those aboard?

Richard Brenneman
Chandler, Arizona

Such provisions are found in FAR 91.3, which says "In an emergency requiring immediate action the pilot in command may deviate from any rule of this subpart A (general rules) or of Subpart B (flight rules) to the extent required to meet that emergency. When a pilot so deviates he must, upon request, file a report of the incident with FAA.

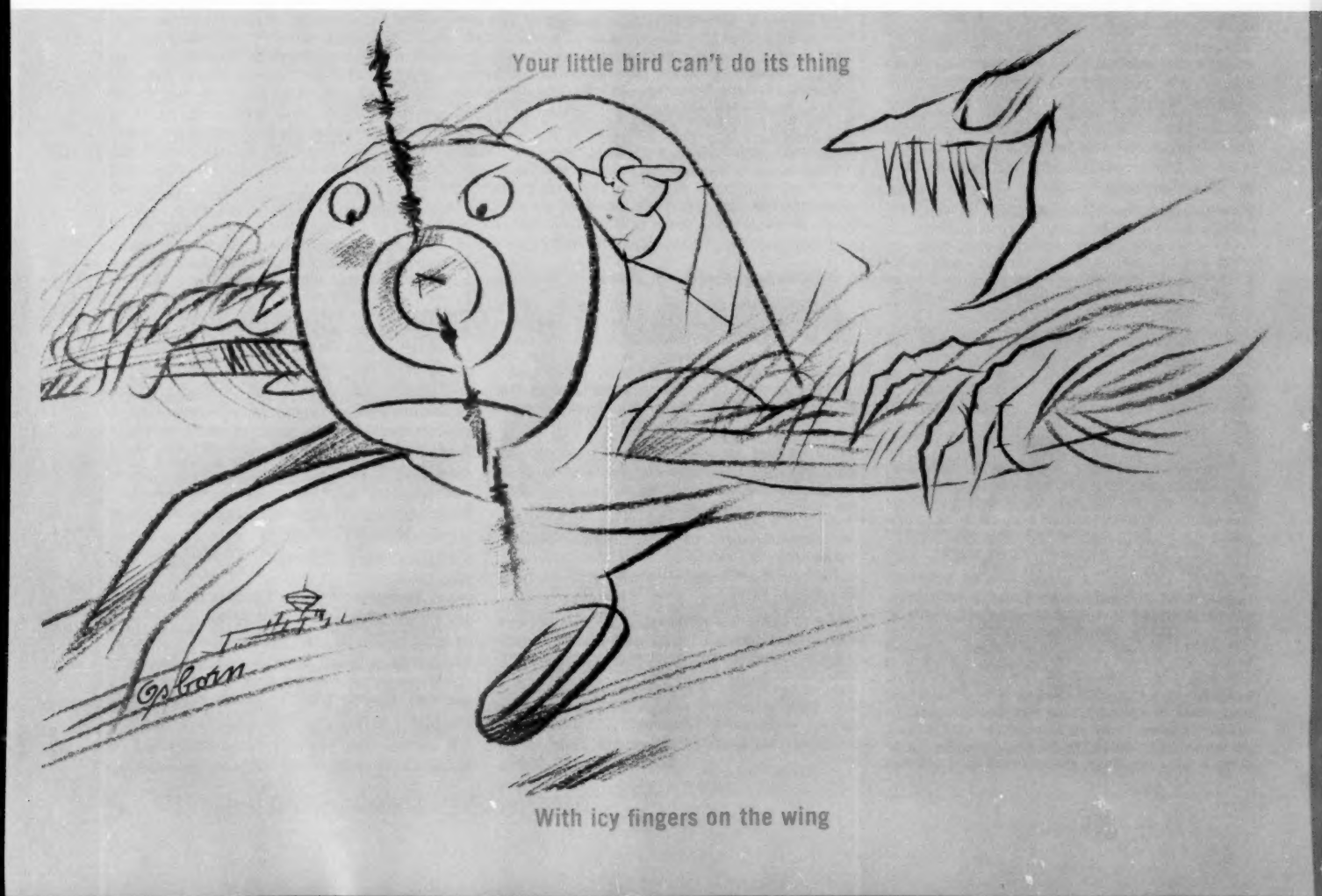
U.S. GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS
WASHINGTON, D.C. 20402

OFFICIAL BUSINESS

RETURN AFTER 5 DAYS

Postage and Fees Paid
Federal Aviation Administration

Third class
DOT 515

U.S. MAIL

FAN SERIA300SAISSDUE002R 1
SERIALS DEPT
XEROX UNIV MICROFILMS
300 N ZEEB RD
ANN ARBOR MI 48106